

REMARKS

In view of the above amendments and following remarks, reconsideration of the rejections contained in the Office Action of December 21, 2001 is respectfully requested.

Interview of April 17, 2002

The Examiner is thanked for his courtesy in granting and conducting the interview with Applicants and their representative on April 17, 2002. It is believed that the interview was productive in helping to address the outstanding issues in this application and simplify such issues for purposes of speeding this application toward allowance.

As noted in the Interview Summary, a number of claims were discussed in the interview. The substantive arguments presented during the interview are set forth below, distinguishing the claims over the prior art of record (the Hoshizaki et al. U.S. patent). As further noted by the Interview Summary form, agreement was reached. The Examiner agreed that Hoshizaki et al. did not disclose or suggest the claimed invention, but noted that an update search would be required before the application could be placed into condition for allowance.

Thus, the above amendments and the following remarks have been presented in a manner so as to help simplify the outstanding issues. Thus while Applicants discussed three separate groups of claims during the interview, it is noted that the claims of the third group which are not also part of the first or second group have now been canceled in order to simplify the issues presented at this time. These claims, as noted during the interview, will be pursued in a continuation application along with the other claims canceled by the above amendment.

The Rejections Made By The Examiner, And The Above Amendments

In the Office Action, the Examiner rejected claims 12-13, 16-19, 22-35, 38-47, 49-78, and 80-87 as being anticipated by Hoshizaki et al., U.S. Patent 5,908,530 (Hoshizaki). Furthermore, claims 14-15, 20-21, 36, 37, 48 and 79 were rejected as being unpatentable over Hoshizaki.

By the above amendments, claims 18-37, 57-67, 72 and 87 have been canceled. Accordingly, the rejections of these claims as been rendered moot. The distinctions between the remaining claims and Hoshizaki will be discussed below.

Before proceeding with the discussion of Hoshizaki, it is noted that the Examiner's position regarding Official Notice set forth at the top of page 3 is specifically traversed. However, in view of other clear distinctions between the remaining claims and Hoshizaki, it is not deemed necessary to further specifically discuss this issue at this time. Nonetheless, Applicants' reserve their right to present arguments and further traverse the Examiner's position regarding official notice.

Claims 73-86 Clearly Distinguish Over Hoshizaki

Claims 73-86, discussed as group I during the interview, include two independent claims, claims 73 and 80. Claim 73 recites that a polishing apparatus includes a plurality of chambers formed in a top ring. Fluid pressures are supplied in the respective chambers to provide a polishing pressure to a central area and an outer circumferential area of a workpiece. Furthermore, the claim recites that a radial width of the outer circumferential area is narrower than that of the central area. Claim 80 is a method claim which requires the step of applying polishing pressure on a surface of a workpiece, wherein an area where the polishing pressure is applied is divided into a central area and an outer circumferential area of the workpiece, with a radial width of the outer circumferential area being narrower than that of the central area.

In the embodiment described with respect to Fig. 1 of the present application, for example, an annular chamber C3 provides a polishing pressure to an outer circumferential area of the workpiece that is radially narrower than that of a central area created by chamber C1.

Having a relatively narrow outer circumferential area has been found by the present inventors to provide significant advantages in controlling the polishing of the edge area and addressing the so-called edge effect. As an example of the difference the use or non-use of such a relatively narrow outer circumferential area can make, please refer to Figs. 3. In Fig. 3A, no pressurized fluid was supplied. Here it can be seen that near the edge, a particularly large amount

of material is removed. When pressurized fluid is supplied only to the first chamber C1, some portion near the edge has an insufficient amount of material removed. Applying only fluid pressure to the outer chamber results in the distribution of material being removed as shown in Fig. 3C. Thus, the ability to precisely control a relatively narrow outer circumferential area can be very advantageous in providing a desired polishing to a workpiece.

Hoshizaki neither discloses nor suggests a radially narrower area as required by each of independent claims 73 and 80. In rejecting these claims, the Examiner referenced discrete concentric chambers 310 and 312. However, in looking at Figs. 16e and 16f, which have chambers 310 and 312, it may be seen that the distance from the center line to the membrane member 370 is smaller, in fact, than the distance from the membrane member 370 to the outer radial extent of chamber 312. Thus, the radial width of the outer circumferential area provided by chamber 312 is in fact wider than the radial width of the central area. Thus it is clear that Hoshizaki does not disclose such a feature.

Nor is there any suggestion from Hoshizaki to modify the structure thereof in this manner. The Embodiment of Figs. 16e and 16f is directed toward being able to change the contour of a wafer 200. Note column 13, lines 22-23. Thus, a wafer is polished into such a contoured shape. It is for this purpose that two separate chambers 310 and 312 are provided. That is, these chambers are provided so as to be able to contour the surface of the platen 277, which will press against the wafer. This thus provides a contoured wafer. Accordingly, it may be seen that the concern of Hoshizaki is to provide a certain contour on the wafer, and is not to provide an area that is relatively narrow for controlling an edge area. Rather, it is noted that Hoshizaki appears to use its presser ring to deal with edge area problems. There is certainly no reason provided to one of ordinary skill in the art from Hoshizaki why they would have modified the radial extent of chamber 312 to be narrower than that of chamber 310.

For the above reasons, it is respectfully submitted that independent claims 73 and 80, and the dependent claims depending therefrom, and thus all of claims 73-86, patentably distinguish over Hoshizaki. Indication of such is respectfully requested.

Claims 12-17, 38-56 and 68-71 Patentably Distinguish Over Hoshizaki

Claims 12-17, 38-56 and 68-71, the so-called group II claims, include independent claims 12, 38, 45, 49, 68, 70 and 71. Each of these claims refers to either independently adjustable pressures or independently controllable pressures applied to different areas of a workpiece. Such features are neither disclosed nor suggested by Hoshizaki.

Thus, for example in independent claim 12, the method recites a step of pressing a workpiece against a polishing surface of a turntable to polish a surface of the workpiece by applying independently adjustable pressures to substantially concentric circular areas of the workpiece. In other words, in different concentric circular areas of the workpiece, the pressures applied to the workpiece can be independently adjustable. The language of claim 38 is slightly different, but to the same effect. Thus, different pressures are applied to different circumferential portions of a workpiece, and these pressures are independently adjustable. Claim 45 refers to this feature by referring to the pressing force being controllable and adjustable in both a central portion and an outer circumferential portion of the workpiece. The polishing pressures, further, are recited as being independently adjustable. Further, claim 49 recites a workpiece carrier wherein a first polishing pressure and a second polishing pressure are controllable independently of each other. Similar language is employed in the method claim of 68. Claim 70 recites the pressures as being controllable independently of each other. Similar language is used in claim 71.

Thus, what is common to each of the independent claims in this group is that they are referring to the pressure that is applied to the workpiece, and such pressures are independently adjustable, or independently controllable or controlled, in different areas of the workpiece.

Independent adjustability or controllability of different areas of the workpiece allows for delicate, precise control over the polishing conditions. Such control is not obtainable with the device of Hoshizaki. The reason for this is that the purpose of Hoshizaki is overall quite different. As discussed above, the object of Hoshizaki is to achieve a wafer with a certain contour. This difference in basic purpose results in that in Hoshizaki, the structure is designed so that the platen 277 will form a certain contour along its bottom surface, so as to apply that contour to the wafer

being polished. However, the structure of Hoshizaki does not allow for providing independently adjustable pressures in different areas of the wafer. This will be explained in detail below.

As noted, for the purpose of providing a specific shape or contour to a wafer, Hoshizaki uses the platen 277. As noted in column 10, line 66, the platen 277 is made of a metal material, for example steel. Because it is made of metal, the pressure applied to the wafer in the different areas of the platen 277 are not independently adjustable, i.e., there will be a dependence on each other, because the platen is metal. For example, as illustrated in Fig. 16f, by applying a vacuum to the chamber 310 and a pressure to the chamber 312, an outer circumferential area is bowed outward while an inner circumferential area is bowed inward. This does not result in two discrete areas in which there are separate and distinct pressures applied to the corresponding areas of the wafer. Rather, it results, because the platen 277 is made of metal, in the metal forming a continuous shape that bows outward in the area 312, but then continues, along the area 312 to start to bow inward, to the outer area of the chamber 310. From the outer area of the chamber 310, the platen 277 continues to bow inward until reaching the middle point. Thus the pressure that is applied to the wafer in the area corresponding to chamber 310 is not independent of the pressure applied to the wafer in the area of chamber 312. For example, if there is a certain pressure in chamber 310, and one imagines the pressure in chamber 312 going from a higher pressure to a lower pressure than the chamber in 310, the outer contours of the area of chamber 310, at least, will change to match the shape of the contour formed by chamber 312. Thus, the pressure that, as a result, gets applied to the wafer in the area of chamber 310 is dependent upon the pressure in the other area.

In other words, because the platen is made of a metal member, and the chambers are used to change the contour of the platen, there will always be an interdependence of the pressure that is applied to the wafer from one area to the other. The pressure in different areas of the wafer or workpiece cannot be independently set by the structure of Hoshizaki. This arrangement is certainly acceptable in Hoshizaki, and desirable, because the goal of Hoshizaki is to achieve a certain contour of the wafer. The goal of the present invention, by contrast, is precise controllability at different areas of the wafer. Thus, by the present invention providing a structure

that allows for independent adjustability or controllability of the pressure at different parts of the wafer, a clear distinction and advantage over Hoshizaki is established.

Accordingly, for the reasons as noted above, it is respectfully submitted to be clear that the present invention as set forth in claims 12-17, 38-56 and 68-71 patentably distinguishes over Hoshizaki. Indication of such is respectfully requested.

Group III Claims

The claims corresponding to group III (reciting at least three different areas or locations on the wafer) which are not otherwise included in the groups above have now been canceled. These claims will be pursued in the continuing application. Thus, of these claims, claims 44 and 55 are included in group II, claims 64 and 66 have now been canceled, claims 69 and 71 are included in group II as well, and claim 72 has also been canceled. This has been done at this time in order to simplify the arguments in the process of the present application.

Conclusion

Again, the Examiner is thanked for his courtesy in granting and conducting the interview of April 17, 2002. Applicants' gratefully acknowledge the fact that agreement was reached on the issues discussed during the interview. The arguments brought forward during the interview are mentioned above, except with respect to the group III claims, which have now been canceled and will be pursued in a continuing application. It is hoped that this will materially reduce the issues for consideration at this time. It is further respectfully submitted that, for the reasons discussed above, all of the claims now pending in the present application patentably distinguish over Hoshizaki. As such, the Examiner is respectfully requested to indicate such on the record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Respectfully submitted,

Masamichi NAKASHIBA et al.

By: 

Nils E. Pedersen

Registration No. 33,145

Attorney for Applicants

NEP/krl
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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